material moved to N.W. at a rate of eighty miles per hour, and appears to have retained approximately the same height of thirty-two miles while it travelled from over a point N. of Alderney Island to over Dartmoor. The streak of the fireball of 1894 August 26 moved to S.E. at a rate of 120 miles per hour, and was about fifty-one miles high. In fact, meteoric streaks from the swifter class of objects, such as Leonids, Perseids, and Orionids, are usually between fifty and sixty miles high. The streak or smouldering residue of the February 22 fireball was much lower than this, though the earlier portions of it exceeded fifty miles in height.

The burning or phosphorescence of the meteoric débris for so long a period after dispersion is remarkable. Moonlight could hardly have produced the effect, as our satellite was only 2¼ days old (setting at 8h. 19m.) and reflected little light. I have never observed meteor streaks to have a lengthened existence in the presence of the full moon, so that another cause inherent in the glowing material must be found for its extraordinary sustenance in the recent case. There must have been something special in its composition or in the condition of the air at the time.

I have received seventy-one observations of the meteor or of its trail, and other descriptions of very useful character ought to come from Havre, Cherbourg, and other places on the north coast of France and from the Channel Islands.

The phenomenon may be aptly described as *the* meteoric spectacle of a generation. As the nucleus sailed along its nearly horizontal course, its light was far from being even. It gave a series of outbursts, the brighter of which much exceeded the lustre of Venus. This comparison applies to a distance of 100 miles. The mate of a vessel in the Channel near Start Point says the light was astonishing, and broke out with startling vividness, so that anyone could have easily seen to read.

At the end of the meteor's flight it seemed to turn abruptly in its direction, and fragments or embers fell almost vertically earthwards about 3°. Then the trail bent to the east and extended rapidly in a horizontal path. The rate of this easterly drift, as seen at Dunstable, Farnham, and other places, was shown on drawings, and appears to have been more than 300 miles per hour, the visible length having increased about eighty miles between 7h. 30m. and 7h. 45m. Something more than mere wind currents would appear to have been instrumental in inducing this rapid translation. The easterly streak appears, in fact, to have occupied at 7.45 the place where the original train existed at 7.30, but which had risen about 20° a quarter of an hour later.

The nucleus of the meteor as it traversed its course threw off a train of fiery sparks, such as is often seen, but these quickly died away. Then slowly the durable streak or trail came out, intensifying rapidly and stretching across the sky like a silver ribbon very irregularly arranged. By one observer in the Channel it was watched for three hours, until it became faintly blended with the Milky Way in Cepheus and Cygnus.

The bend in the path of the fireball at the limits of its westerly flight and the remarkable streak which quickly formed far to the east are curious. It has been suggested that there may have been a second meteor responsible for the lower streak stretching to the eastward. But as hundreds of persons were watching the sky, it would have been and reported had it been visible. At the termination of the meteor's career it evidently suffered disruption by two violent explosions, the places of which were definitely marked by brilliant condensations at the angles of the bent streak. Is it possible that on the bursting and disintegration of the mass one large fragment was hurled in a direction nearly opposite to that of the original course? The resistance of the air at the comparatively low altitude of the meteor must have been considerable in checking its velocity, but some more potent influence must have suddenly stayed the westerly rush of the object, diverted it or its material earthwards, and then, as abruptly, dispersed it far and rapidly eastwards.

W. F. DENNING.

NOTES.

THE following fifteen candidates have been selected by the council of the Royal Society to be recommended for election into the society:—Mr. E. C. C. Baly, Sir Thomas Barlow, Bart., Rev. E. W. Barnes, Dr. F. A. Bather, Sir Robert A. Hadfield, Mr. A. D. Hall, Dr. A. Harden, Mr. A. J. Jukes-Browne, Prof. J. G. Kerr, Prof. W. J. Lewis, Prof. J. A. McClelland, Prof. W. McFadden Orr, Dr. A. B. Rendle, Prof. J. Lorrain Smith, and Prof. J. T. Wilson.

THE *Times* announces that a well-equipped aërodynamic laboratory is about to be established by the Aéro Club de France with the assistance of the State. It is computed that more than 5000*l.* will be required to start this project, the utility of which is unquestioned. Practical tests in planes, propellers, engines, &c., will be carried out at this laboratory.

THE seventh annual session of the South African Association for the Advancement of Science will be held at Bloemfontein during the week ending October 2, under the presidency of Sir Hamilton J. Goold-Adams, K.C.M.G. The assistant general secretary is Mr. E. Hope Jones, P.O. Box 1497, Cape Town.

THE sixth International Psychological Conference will be held at Geneva from August 3 to 8 next. An exhibition is being arranged, and a special section is to be devoted to animal psychology. M. E. Claparède, 11 avenue de Champel, Geneva, is the general secretary, and M. Cellerier, Montchoisy, Geneva, is the treasurer.

THE Paris correspondent of the *Daily Chronicle* states that the wireless telegraph station on the Eiffel Tower has been receiving messages from the station at Glace Bay, Canada, a distance of 3250 miles. A new installation is being fitted at the Eiffel Tower, by means of which it is hoped to establish wireless telegraphic communication with Saigon (Cochin China), a distance of 6800 miles.

ON Thursday next, March 11, Mr. A. D. Hall will begin a course of two lectures at the Royal Institution on "Recent Advances in Agricultural Science." The Friday evening discourse on March 12 will be delivered by Mr. S. G. Brown on "Modern Submarine Telegraphy," and on March 19 by Mr. R. Threlfall, F.R.S., on "Experiments at High Temperatures and Pressures."

THE Berlin correspondent of the *Times* announces the death of Prof. H. Ebbinghaus, professor of philosophy at the University of Halle, at fifty-nine years of age. Prof. Ebbinghaus contributed extensively to the *Zeitschrift für Psychologie,* of which he was the founder, while of his several books the best known are his work "On the Memory" (1885), and the first volume, which appeared three years ago, of the unfinished "Principles of Psychology."

AN exhibition of optical and ophthalmological appliances will be held in the rooms of the Medical Society of London on March 12 and 13, from noon to 10 p.m. each day.

MUCH interest is being taken in the International Aëronautical Exhibition which will be opened at Frankfurt a. M. in the beginning of July next. Four sheds will be reserved for airships, which will make ascents, with passengers, from the exhibition grounds. Frequent ascents will also be made by ordinary balloons, and various aëronautical societies have been invited to take part in them. Flights with aëroplanes, in which some of the best-known aviators will compete, promise to be of special interest. Industries connected with aëronautics will be represented, and one section will be devoted to inventions and apparatus of the past. Wireless telegraphy and carrier pigeons will be employed for communications to and from the exhibition, and some prizes of considerable value will be awarded.

TELEGRAPHIC messages from Havana through Reuter's Agency announced that on February 27, beginning at 11.21 a.m., the seismograph there was disturbed intermittently for forty minutes. The earth waves moved from east-north-east to west-south-west. A message from Palmi, Calabria, on the same date states that a violent earthquake shock was felt there at 1.50 a.m., and that two other shocks followed later. From the same source it is reported that a slight shock was felt at Reggio di Calabria at 6.45 p.m. Reuter further reports that soundings taken in the Straits of Messina and in the ports of Messina and Reggio di Calabria show that no alteration in the ocean floor in those parts or in the coast-line was caused by the recent earthquakes. Prof. Milne recorded at Shide, Isle of Wight, on February 27, at 4.58 p.m., an earthquake of great intensity, which was at its maximum at 5.36 p.m. The origin of this disturbance was about 5000 miles distant.

THE thirty-first annual general meeting of the Institute of Chemistry was held on Monday, March 1, Prof. Percy F. Frankland, F.R.S., the retiring president, in the chair. In his presidential address, Prof. Frankland emphasised the fact that whilst the well-being of the community is greatly promoted by the services of competent chemists, the mischief which can be wrought by the ill-trained and incompetent is incalculable. It is one of the chief duties of the institute to maintain a high level of training for professional chemists by demanding of candidates for its membership evidence of thorough training, and by requiring them to pass searching examinations. Particular attention has been given lately to the educational side of the institute's activity. Referring to research, Prof. Frankland reminded the fellows that the results of research are not necessarily recorded in the Transactions or Proceedings of a scientific society or journal. There is a vast amount of research involving originality and attainments of the highest order which from its very nature cannot be published at all. Many chemists whose names are not associated with academic researches are nevertheless fully equipped and highly original investigators. There is much training in originality of thought and experimental procedure which is not called research, and much of what is called research involves no originality in the thought or deed. After congratulating the institute on the choice of Dr. George T. Beilby, F.R.S., as the new president, Prof. Frankland thanked the fellows and associates for their kindness and consideration during his term of office. On behalf of the fellows and associates the president then presented an illuminated address to Mr. David Howard, in recognition of his services to the institute in various capacities, as member of council, honorary treasurer (eighteen years), president, vice-president, and censor, extending altogether more than thirty years, at the same time congratulating him on the approach of his seventieth birthday, while yet retaining remarkably his health and vigour.

THE Elizabeth Thompson Science Fund, to which reference has been made in previous years in these columns, established "for the advancement and prosecution of scientific research in its broadest sense," now amounts to 5200*l*. As accumulated income will be available next month, the trustees of the fund desire to receive applications for grants in aid of scientific work. This endowment is not for the benefit of any one department of science nor for men of science of any particular nationality, but it is the intention of the trustees to give preference to investigations which cannot otherwise be provided for, which have for their object the advancement of human knowledge or the benefit of mankind in general, rather than to researches directed to the solution of questions of merely local importance. Applications for assistance from the fund must be accompanied by full information as to the precise amount required, the exact nature of the investigation proposed, the conditions under which the research is to be prosecuted, and the manner in which the grant asked for is to be expended. All applications must reach, before March 15, the secretary, Dr. C. S. Minot, Harvard Medical School, Boston, Mass., U.S.A. Decided preference will be given to applications for small amounts, and grants exceeding 60*l*. will be made only in very exceptional circumstances. Prior to 1898, eighty-one grants were made, and of these seven only have yielded no published result. Since 1898 sixty-five further grants have been made, and the work aided by some of them is still unfinished.

THE weather report for the week ending last Saturday, February 27, shows that the temperature over England was considerably below the average, especially in the south, the deficiency in the south-east of England amounting to 5°·4. In the south-west and south-east of England the shade temperature fell below 15°. At Greenwich the thermometer in the sun's rays registered 97° on February 22, whilst during the preceding and following nights the exposed thermometer on the grass registered 11°. The lowest shade temperature for February was 19°, on the morning of February 23. The mean temperature at Greenwich for February was 37°, which is about 2°·5 below the average of the previous sixty years. Frost occurred in the open each night with the exception of February 4 and 5. The rainfall was less than one-half of the normal, whilst the sun was shining ninety-one hours, which is thirty-four hours more than usual. The summary given by the Meteorological Office for the thirteen weeks which constitute the winter, ending February, shows that the mean temperature was generally below the normal, the extreme readings ranging from 59° in the south of Ireland, and 58° in the east of Scotland and the east of England, to 3° in the Midland counties and the south-east of England. The rainfall was deficient over the entire kingdom, the deficiency ranging from 4·21 inches in the south-west of England to 0·24 inch in the north of Ireland. The duration of bright sunshine was generally in excess of the average, especially over the southern portion of England. At the close of February and on the opening days of March a touch of real winter was experienced over the entire area of the British Islands, as well as generally over western Europe; sharp frosts occurred in all parts, with heavy snow.

THE Bill "to promote the earlier use of daylight in certain months yearly"—formerly known shortly as the Daylight Saving Bill—is down for the second reading in the House of Commons to-morrow (Friday). The Bill represents the shape of the resurrection of a measure which passed its second reading in the House a year ago, and was referred to a select committee. The unscientific character of the proposal and the confusion which would follow should the measure ever find a place in the Statute-book were stated clearly in NATURE of July 9, 1908. To the views expressed in that article most competent authorities will subscribe. For the sake of history, we give the substance of the measure, but it is difficult to believe that the House of Commons will consent to the system of self-deception which is advocated by the promoters of the Bill, with complete disregard of the consequences. The operative clauses of the Bill are as follows:—(1) From two o'clock in the morning Greenwich mean time in the case of Great Britain, and Dublin mean time in the case of Ireland, of *the third Sunday in April* in each year until two o'clock in the morning Greenwich mean time in the case of Great Britain, and Dublin mean time in the case of Ireland, of *the third Sunday in September* in each year the local time shall be in the case of Great Britain one hour in advance of Greenwich mean time and in the case of Ireland one hour in advance of Dublin mean time, and from two o'clock in the morning Greenwich mean time in the case of Great Britain, and Dublin mean time in the case of Ireland, of *the third Sunday in September* in each year until two o'clock in the morning Greenwich mean time in the case of Great Britain, and Dublin mean time in the case of Ireland, of *the third Sunday in April* in each year the local time shall be in the case of Great Britain the same as Greenwich mean time and in the case of Ireland the same as Dublin mean time. (2) The time hereby established shall be known as summer season time in Great Britain and Ireland, and whenever any expression of time occurs in any Act of Parliament, deed, or other legal instrument, the time mentioned or referred to shall, unless it is otherwise specifically stated, be held in the case of Great Britain and Ireland to be summer season time as prescribed by this Act. (3) Greenwich mean time as used for the purposes of astronomy and navigation shall not be affected by this Act. (4) This Act shall apply to the United Kingdom of Great Britain and Ireland, and may be cited as the Summer Season Time (Great Britain and Ireland) Act, 1909.

IN the course of a paper published in vol. iv., Nos. 1 and 2, of the *Bio-chemical Journal* on the relations of certain marine organisms to light, Prof. B. Moore directs particular attention to the periodicity of their phosphorescence. That light from without influences this phenomenon is demonstrated by the fact that the periods of activity and rest in regard to phosphorescence follow, respectively, the hours of daylight and darkness. How deep-seated is this periodicity has been demonstrated by experiments on copepods, in which it persisted for no less than twelve days in the absence of the accustomed recurring stimulus of nocturnal darkness and diurnal light. It is added that the phosphorescence of these copepods in captivity is spontaneous, and although increased by mechanical stimulation, goes on vigorously even when the organisms are at rest and undisturbed.

THE February number of the *Zoologist* contains a remarkably interesting account, by Mr. H. W. Bell-Marley, of hunting the hump-backed whale in Natal waters. For some years it has been observed that between May and August large numbers of hump-backs pass between Natal and the Delagoa Bay coast, and in May, 1908, some enterprising Norwegians obtained permission to set up a whaling-station on the Bluff side of the channel. Their success may be judged from the fact that between July and the early part of September no fewer than one hundred and two hump-backs and two rorquals were taken. The supply is, however, not exhausted, as the writer describes steaming into the midst of a school of about a score of these monsters, the movements and gambols of which afforded a most wonderful and thrilling spectacle. Nevertheless, such vigorous fishing cannot long be carried on without seriously diminishing the numbers of the whales, and Mr. Bell-Marley is of opinion that, if their extermination is to be prevented, action ought forthwith to be taken by the Colonial Government.

AN interesting pamphlet, written by Mr. H. A. Ballou, has just been issued by the Imperial Department of Agriculture for the West Indies on "millions" and mosquitoes. Millions are small fishes, the full-grown female measuring about 1½ inches in length, while the male is much smaller; they belong to the species Girardinus, the particular variety dealt with in the pamphlet being *G. poeciloides*, De Filippi. They live in shallow water, and are such voracious feeders on the eggs, larvæ, and pupæ of mosquitoes that these insects are unable to breed in streams and ponds stocked with them. They commonly occur in Barbadoes, and in consequence the Anopheles mosquito, which disseminates malaria and breeds only in shallow streams, pools, or marshes, has never been able to spread, and Barbadoes is free from malaria. The Imperial Department has since 1905 made shipments of these fishes to several West India islands, and from all sources favourable reports have been received. At Antigua the Board of Health has undertaken the work of stocking all the ponds and streams, and the mosquito nuisance has abated in consequence. It is pointed out, however, that certain varieties of mosquitoes, *e.g. Culex fatigans* and *Stegomyia fasciata*, breed in small temporary collections of water, such as those found on house-tops, in rain-water tanks, bottles, the concavities of leaves, &c., and will therefore escape destruction by the "millions."

DARWIN and the mutation theory form the theme of the opening article, by Mr. C. F. Cox, in the February number of the *American Naturalist*. After mentioning that the great evolutionist would not have accepted, at least in its entirety, the mutation theory of de Vries, the author states that "he was compelled to concede that what we now call mutation had occasionally taken place and become the starting point of new races, but he was none the less unshaken in the conviction that this process was exceptional and extraordinary, and that, as a rule, a new species originated by the gradual building up of minute and even insignificant deviations from the average characters of an old species. . . . For the doctrine of 'insensible gradations,' which touched mainly a minor premise in his general argument for evolution, Mr. Darwin was almost willing to relinquish the essence of the whole matter, which was his claim to the discovery of a *vera causa* in the evolutionary process. . . . The establishment of the theory of natural selection was Mr. Darwin's greatest and most original achievement. Time has proved that he could have afforded to stand upon the general validity of this theory, though everything in his argument in its favour had needed review and modification. . . . Properly regarded, the mutation theory does not antagonise or weaken the doctrine of natural selection—on the contrary, it merely offers itself as a helpful substitute for, or adjunct to, one of Darwin's subordinate steps in the approach to a consistent philosophy of the origin of species, leaving the great cause of evolution as efficient as ever. It is, therefore, one of the tragedies of science that in this matter Darwin should have been ready to surrender his main position rather than to receive and to join forces with those who were coming to his aid."

In the number of *Man* for February Mrs. M. E. Cunnington describes the result of the excavation of a late Celtic rubbish-heap near Oare, in Wiltshire. From the number of potsherds unearthed it was supposed by some authorities that the mound represents the accumulated débris of a pottery; but there are no signs of distortion during baking in any of the fragments, and the number of animal bones points to the existence of a considerable settlement. The pottery falls into two classes, that of native manufacture and that imported. Most of the examples of the former type are not inelegantly shaped bowls with a contracted mouth and bead rim. These are of purely British manufacture, and are characteristic of the late Celtic period, like the examples from Weymouth in the British Museum and those of the same period at Colchester. The foreign ware is of various types—Belgic of the first century A.D., green-glazed Roman ware from Gaul, and several pieces of very thin white and cream-coloured pottery, which probably came from Rheims about the same time. More remarkable are examples of the rare Arretine ware, while the absence of the later Gaulish red Samian corroborates the date of this accumulation, which seems to have been made just before the Roman occupation of that part of the island. If the date of the neighbouring Martinsell Camp could be established, it is possible that its garrison may have had some connection with the inmates of this settlement.

The *National Geographic Magazine* for January continues its campaign against the destruction of the State forests of America by lessons drawn from two countries of the old continent. Mr. E. L. Harris, in his notes on the buried cities of Asia Minor, shows that in the neighbourhood of Pergamus the ruin has been so widespread that it is doubtful if any rational system of forestry can now restore the trees which once covered the higher grounds and permitted a flourishing agriculture in that region. Mr. F. N. Meyer points out that in a large part of northern China, which in the time of Marco Polo was the seat of extensive silk culture, the mulberry trees have disappeared, the rivers once used for carriage of goods have shrunk in volume, and the deserted wells bear witness to the shameful destruction of the forests. The denudation of the hill-sides is said to have diminished the rainfall, the soil on the slopes has disappeared, and disastrous floods result from the rapid dissipation of the water in the rainy season. Here, too, the mischief seems to be almost past remedy, and unless the Chinese Government takes immediate and active measures the eastern extension of the Mongolian desert is inevitable.

There is certainly room for a popular, well-illustrated periodical dealing with the lighter side of geographical work, and this want seems likely to be supplied by the new magazine *Travel and Exploration.* The March number contains articles by competent writers describing expeditions in many parts of the world. The best of these is that by Lord Hindlip on a hunting trip in the Nahlin or Cassiar mountains, near the famous Dawson Trail leading to Klondike, in which he was successful in obtaining fine specimens of the wild sheep. Miss E. C. Sykes is also a little off familiar ground in her account of a ride along the little-known route in northern Persia from Meshed to the railway line which runs between Merv, Askabad, and Krasnovodsk. The scheme of this new periodical includes reviews of current geographical literature, which, it may be hoped, will soon develop into an adequate bibliography.

A summary and bibliography of literature dealing with Russian botany, that was published in 1906, has been issued as a supplement to the *Bulletin du Jardin impérial botanique*, St. Petersburg. The contents are, it may be mentioned, practically inaccessible except to Russian scholars.

Sir Joseph Hooker has made a further contribution to the classification of the genus Impatiens in the first number of the *Kew Bulletin* for the current year, where he furnishes a description of species from Indo-China and the Malayan Peninsula. The comparison of selected characters leads to the conclusion that the species from these regions are closely allied, and show some affinity with Burmese species, but differ greatly from the Chinese. Four of the specimens are made the types of new species. Another systematic article is provided by Mr. T. A. Sprague, being a revision of the section Omphacarpus of the genus Grewia.

Dr. M. Samec communicates to the *Sitzungsberichte der kaiserlichen Akademie der Wissenschaften* (vol. cxvii., part v.), Vienna, a note on the variation in the intensity of light at different altitudes. During a balloon journey he took a series of readings for comparison with measurements made by Prof. Wiesner in the course of his investigations regarding the amount and nature of the light falling upon plants. Readings were taken of the intensity of sun-light and of diffused light. The figures are somewhat irregular, but the intensity of sun-light increased with ascent, and more rapidly than the intensity of the diffused light. The measurements of light reflected from below showed a series of maxima corresponding with the passage of the balloon over water.

An account of the constructive work for restraining the flow of torrents and of the *reboisement* of mountain slopes near Interlaken contributed by Mr. C. E. C. Fischer to the *Indian Forester* (January) should indicate to the authorities in India the value attached to such precautions in Switzerland, and may possibly help towards the establishment of a similar policy. Although avalanches and storms are important factors in denudation, the prime agent is the browsing goat. The chief features in construction are the retaining walls built at intervals across the valley, the channels for leading off the streams, and wattle fences for checking the downward flow. Grass is planted between the fences, and prepares the ground for early settlers such as *Sedum annuum* and Adenostyles; later on, Parnassia, orchids, aconites, and other plants appear on the scene, and in two or three years alders or pines may be planted.

We have received a discussion of the winds at Rome by Dr. I. Massarini, deduced from anemograph records for 1876–1905, and reprinted from the Annals of the Italian Meteorological Office, vol. xxvii., part i. The author has dealt with the subject in great detail, and has calculated, *inter alia*, the frequency of wind direction under sixteen points and their velocity with respect to the hours of the day, as well as for months, years, and for periods of ten and thirty years; also the velocity for the same periods, irrespective of direction, and has exhibited the results in fifty-four tables and nine plates. We can only note here the following general remarks:—(1) Direction. The most frequent winds are (in order of their frequency) N.N.E., N., and S.; the least frequent is the E. wind. (2) Velocity. The strongest winds are S.S.E., S., S.S.W., and N.N.E.

(the last two having equal values). The weakest wind is from N.W. During three years, 1873–5, a Robinson anemometer was in operation; the author has supplemented his valuable work by a separate discussion of these data.

The Memoirs of the Indian Meteorological Department, vol. xx., part v., contain a laborious and valuable analysis, by Mr. R. L. Jones, of the records of the anemograph (Meteorological Office pattern) at the Madras Observatory for eleven years, 1865–75. The tables give (1) the mean hourly movement of air, irrespective of direction, for each hour of the mean day of each month and for the year, and the constants of the periodical formulæ; (2) mean hourly southerly and westerly components, and the constants of the periodical formulæ, with computed values in each case. The chief features of the mean monthly air movement (irrespective of direction) are (*a*) a nearly uniform increase during the hot-weather period; (*b*) a more or less uniform decrease approximately during the south-west monsoon period; (*c*) a nearly uniform increase during the transition period; (*d*) a nearly uniform decrease approximately during the cold-weather period. The curves showing the daily variations exhibit a general resemblance to the daily variations in air temperature. The resultant air movement deduced from the southerly and westerly components is (1) between north and east during the transition and cold-weather periods; (2) between east and south during the hot-weather period; and (3) between south and west during the south-west monsoon period.

Some of the troubles which have to be faced by engineers in Egypt are described by Mr. J. B. Van Brussel in an article on mechanical irrigation plants in the *Engineering Magazine* for February. Part of the Nile irrigation station at Wadi Kôm-Ombo consists of a steel canal 5200 feet in length and nearly semicircular in section, 20 feet diameter, and about 12 feet deep. The canal is used for conveying water from the service reservoir and distributing it to earth canals, or culverts, and is made up of seventeen sections, each about 310 feet long and constructed of riveted steel plates 6 millimetres thick. The sections are connected by expansion joints, and have a fall of level of 1 centimetre per 310 feet. Great difficulty was experienced in preserving the level while building, owing to the action of the wind passing through spaces where the dry foundation sand had been removed for riveting, thus causing the sand to drift and the wood cradles to sink. Often a whole section would sink several inches in a night. During the construction difficulty was also experienced due to unequal expansion. According to the side of the canal on which the sun was shining more strongly, the end of a section would move out of the centre line to one side or the other to the extent of as much as 4 inches. This movement stopped when the earth was banked up round the steel structural work, and the water began to flow through the canal.

The January number of *Ion* contains a translation of the second memoir of the radium commission of the Academy of Sciences of Vienna. It deals with the evolution of heat by radium, and for it Drs. E. von Schweidler and V. F. Hess are responsible. Experimenting with more than a gram of radium-barium chloride enclosed in a glass tube a millimetre thick, surrounded by a copper vessel 5 millimetres thick, they have found that the heat generated by 1 gram of pure radium in these circumstances is 118 gram-degrees per hour. *Ion*, by a curious misprint, omits to give its readers this number.

An examination of the whole of the material at present available on the variation of the refractive indices of mixtures of liquids with their composition has led Dr. V. F. Hess, of the University of Vienna, to formulate, in a paper which appears in the July, 1908, number of the *Sitzungsberichte* of the Academy of Vienna, a simple law for the refraction constant of a mixture. If the excess of the observed density of a mixture over that calculated from the densities of the constituents be divided by the observed density, and if the corresponding quotient for the refraction constants be found, Dr. Hess shows that if it is assumed that the two quotients for each mixture are proportional to each other, the calculated values of the refraction constants may, by a proper choice of the factor of proportion, be made to agree very closely with observation. The factor differs in value for each pair of liquids, changes a little with change of temperature, but is practically the same for all rays of the spectrum. Any one of the three refraction constants at present in use may be used in the calculations.

The moving-coil galvanometer is now used so extensively on account of its insensibility to outside magnetic disturbances that Dr. M. Reinganum's article in the *Physikalische Zeitschrift* for February 1, describing two methods of making the instrument suitable for measuring smaller currents than it has been capable of measuring previously, will be welcomed by many of our readers. In the first method about 6 centimetres of soft iron wire, 0·33 millimetre diameter, is attached to the top of the coil outside the strongest part of the magnetic field, and at right angles to the lines of the field. In the second method a similar piece of magnetised steel wire is attached to the coil parallel to the field, but with its poles reversed. In each case the sensitiveness of the instrument is greatly increased, and in one case described by the author, with the steel wire, it was raised to ten times its original value without the deflections ceasing to be proportional to the current passing through the coil.

In Reprint No. 101 from the Bulletin of the Bureau of Standards, v., 2 (Washington: Government Printing Office, 1908), Mr. Louis Cohen discusses the influence of terminal apparatus on telephonic transmission. It is pointed out that when a telephonic wave reaches the receiving instrument part of it is reflected, and that the proportion of the reflected and absorbed waves is a function of the frequency. Thus every harmonic will be affected differently, and a certain amount of distortion will be produced. The subject is eminently suited for the methods of mathematical analysis which the author applies. The outcome of the discussion is that in short-distance transmission the introduction of a condenser into the circuit will improve the transmission. This is the conclusion derived from an application to a cable 30 km. long. For long-distance transmission, taking as an example a length of 300 km., the author finds that the condenser has little effect.

Messrs. Macmillan and Co., Ltd., have published the "Mathematical Papers for Admission into the Royal Military Academy and the Royal Military College for the years 1899–1908." The papers have been edited by Messrs. E. J. Brooksmith and R. M. Milne, who have also provided answers. The price of the volume is 6*s*.

Messrs. Crosby Lockwood and Son have just published the second edition of Dr. J. Erskine-Murray's "Handbook of Wireless Telegraphy." The original work was reviewed in Nature of October 3, 1907 (vol. lxxvi., p. 563). About fifty pages of new matter have been added, and the whole text has been revised in the light of present knowledge of the subject.

MESSRS. H. W. COX AND CO. have issued a new catalogue of electromedical apparatus, which contains, in addition to the descriptions of the apparatus, short sketches of the theories of their action, and instructions how best to set them up. It should prove of exceptional value to medical practitioners who have not had the advantage of a practical training in the manipulation of physical apparatus.

WE have received from Washington a copy of the report of the Librarian of Congress and of the report of the superintendent of the library buildings and grounds for the fiscal year ending June 30, 1908. Like all American reports, it is of a detailed and exhaustive character, and provides information as to accessions, expenditure, new arrangements, and other matters of particular importance to librarians. It is of interest to note that, in addition to the Library of Congress, with its million and a half books —to say nothing of manuscripts, prints, maps, and charts —there are above a score of libraries maintained by the Federal Government at Washington. Among these may be mentioned those of the Department of Agriculture with 60,000 volumes, the Bureau of Education with 82,000, the Geological Survey with 80,000, the Patent Office with 80,500, and the National Museum with 20,000. Some of the special collections, like that of the U.S. Geological Survey, are unique in character, so it is easy to see that the American student is very fortunate in his facilities for reference to standard authorities and original sources.

OUR ASTRONOMICAL COLUMN.

THE SPECTRA OF VARIOUS NEBULÆ. The spectra of several nebulæ, as photographed at Heidelberg with the Waltz reflector, are briefly described by Prof. Wolf in No. 4305 of the *Astronomische Nachrichten* (p. 151, February 16).

Prof. Wolf states that the planetary nebula N.G.C. 6210 = B.D. + 24°.3048 is so bright that he is able to photograph the ten lines of its spectrum with only a brief exposure. These include six of the chief lines, at λλ 501 (i.), 434 (iii.), 410 (iv.), 397 (v.), 387 (vi.), and 373 (vii.), lines at λλ 412, 447, and 496, and Hβ; the second nebula line, at λ 469, is not recorded, and Hγ is clearly double.

The Ring nebula in Lyra shows the seven chief lines, Hβ, and the line at λ 496, but no spectrum of the central star is registered. Exposures without the spectrograph give an image of the ring in twenty seconds, but give no trace of the star, thus showing that the latter is less active, photometrically, than the ring itself. Using Wratten and Wainwright's "panchromatic" plates, Prof. Wolf also got the C line of hydrogen registered, and found it to be as bright as the other hydrogen lines. By using an open slit, annular images showing the monochromatic forms and sizes of the nebula were obtained; the ring at λ 469 was found to be the smallest, whilst that at λ 373 is the largest.

Long exposures on the cluster of nebulæ near the galactic pole (12h. 53m., +28°·6) showed continuous spectra with maxima, but the condensations are too weak to measure. The spectrum of N.G.C. 6960, HV 15 Cygni, is purely gaseous, the brightest line being that at λ 373, followed by λ 434 (Hγ), and traces of other lines. N.G.C. 6992, HV 14 Cygni, shows the same spectrum with the addition of Hβ. The Milky Way nebula, N.G.C. 2023, again shows the lines at λλ 373, 434, and 486, but the line λ 373 is abnormally bright, and there is a suspicion of an additional line at about λ 345.

THE PROPOSED PROGRAMME OF WORK FOR THE REYNOLDS REFLECTOR AT HELWAN, EGYPT.—From a note in No. 27, vol. ii., of the *Cairo Scientific Journal* (p. 417, December, 1908), we learn that the Reynolds reflector at the Helwan Observatory is to be used, primarily, for the photography of nebulæ lying between the equator and 40° south declination.

Mr. Knox Shaw shows that the instrument, owing to its comparatively short focal length, is unfitted for work on the sun and moon, whilst the absence of a large finder renders the photography of faint satellites impracticable; the ratio of the focal length to the aperture (30 inches) is only 4·5.

In the proposed zone there are between two and three thousand known nebulæ, of which the great majority have as yet only been observed visually, and, according to Keeler's estimate of their distribution, there should, in such a zone, be some 40,000; it therefore appears that the Reynolds reflector is provided with a very useful programme for a lengthy period.

OBSERVATIONS OF COMET TEMPEL$_3$-SWIFT.—In No. 4306 of the *Astronomische Nachrichten* (p. 159, February 18) Prof. Barnard records his observations of the periodic comet, Tempel$_3$-Swift (1908*d*), during its recent reappearance. Observations were made on four days in December, 1908, and the comet was found to be a small faint body of less than the sixteenth magnitude.

A new double star and two new nebulæ were discovered during the observation of the comet, and Prof. Barnard found that the star B.D. + 43°.53 is one of the finest crimson stars in the heavens; on December 20, 1908, he recorded it as an exquisite object as seen in the 40-inch refractor.

THE LEVELS OF SUN-SPOTS.—From Mr. Dodwell, of the Observatory, Adelaide, we have received a stereogram which confirms Dr. Krebs's observation of the different levels of sun-spots, referred to in this column for August 27, 1908 (No. 2026, vol. lxxviii., p. 402).

The two photographs from which the stereogram was prepared were taken by Mr. A. W. Dobbie, of Adelaide, during the solar eclipse of 1905, and the two groups of spots then visible on the solar disc distinctly appear to be at different levels. Mr. Dobbie used an 18-inch Newtonian reflector of 13 feet focal length, made by himself, and stopped down to an aperture of 4·5 inches. The exposures given were of about 1/1000th of a second duration, and the interval between the two was about 2½ hours.

A NEW "CAVE-NEBULA" IN CEPHEUS.—On a plate taken by him with the Bruce telescope at Heidelberg, on October 21, 1908, Dr. Kopff discovered an interesting nebula in the constellation Cepheus.

Later photographs taken by Prof. Wolf, with the Waltz reflector, show this object to be a good example of the singular phenomenon of cave-formation amongst Milky Way stars. The star B.D. + 69°.1231 is involved in the nebula, which is situated at the southern extremity of a long, starless space covered with intricate patches of nebulous matter and dark areas, and traversed by a bridge of stars, from east to west, at about 22h. 10m., +70° 0′. The position (1855·0) of the B.D. star is α = 22h. 10m. 1s., δ = +69° 31′·7.

A reproduction of the region showing this interesting object accompanies Prof. Wolf's paper describing it in No. 2, vol. lxix., of the Monthly Notices (R.A.S.).

THE RECENT MAGNITUDE OF NOVA PERSEI.—In No. 4303 of the *Astronomische Nachrichten* Prof. Nijland publishes the results of a series of magnitude observations of Nova Persei (No. 2) made at the Utrecht Observatory between July, 1904, and April, 1908. The apparent variations, if real, are unimportant and irregular, the four yearly values being 10·63, 10·53, 10·58, and 10·59, mean 10·58; on Father Hagen's scale this magnitude lies half-way between his stars 42 and 49.

DOUBLE-STAR MEASURES.—Nos. 4301 and 4302 of the *Astronomische Nachrichten* are devoted, to the extent of eighteen three-column pages, to the results of recent micrometer measures of double stars, made by Prof. Burnham with the 40-inch refractor of the Yerkes Observatory. The measures form part of the observer's general programme of observing neglected doubles, to investigate proper motions, and to provide material which may in future have special value in any discussion of the pairs given in the general catalogue.

A series of notes, dealing respectively with the individual systems, is also given, and will undoubtedly prove useful in any subsequent discussions.